REMARKS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 37-78 are pending, Claims 37, 61, 73, 74 and 79 having been amended by way of the present amendment.

In the outstanding Office Action, the Specification was objected to; Claims 37-79 were rejected under 35 U.S.C. 112, second paragraph; Claims 37-40, 44-57, 59, 61, 62, and 68-74 were rejected as being unpatentable over Prueitt et al. (US Patent No. 5,374,914, hereinafter Prueitt), in view of Elton et al. (US Patent No. 5,036,165, hereinafter Elton); Claims 41-43, 58 and 75-78 were rejected as being unpatentable over Prueitt in view of Elton and UK Patent 2140195 (hereinafter, GB '195); and Claims 63-67 were rejected as being unpatentable over Prueitt in view of Elton and Donaldson et al. (US Patent No. 5,339,062, hereinafter Donaldson).

In reply, the Specification has been amended to address the informality identified at page 2, line 27, as pointed out in the outstanding Office Action.

As requested, each of the independent claims has been amended to define SMES as "superconducting magnetic energy storage".

Claim 58 has not been amended because it is believed that the present language is clear that the three materials need not be the same material.

Claim 60 has not been amended because it is intended to clarify, under the doctrine of claim differentiation, that the three materials in Claim 57 (from which Claim 60 depends) may be different materials that have different properties.

Claims 73 and 74 have been amended as requested.

The present invention has been made in recognition of a limitation with conventional SMES devices, namely that there is a need to have a high voltage SMES device where the superconducting conductors of the SMES are insulated against high voltage and the insulation is concentric around the conductors.[1] Having the SMES device with conductors that are wholly electrically insulated in such a way that there is no electric field outside of the superconducting cable simplifies the mechanical structure of the SMES and provides fewer problems with the mechanical stability of the SMES device.[2] By holding the outer semiconducting layer at a controlled electrical potential, the electric field is contained within the electrical insulation.[3] The superconducting cable is flexible at normal ambient temperatures and thus can be bent or flexed into its desired winding shape prior to operation at cryogenic temperatures.[4]

Claim 37 is directed to an SMES device that includes a coil made of a superconductor and an electrical insulation. The electrical insulation includes an inner layer of semiconducting material, an outer layer of semiconducting material, and an intermediate later of semiconducting material.

Prueitt describes a compact magnetic energy storage module. The main objective in Prueitt is to make a storage device that can store large quantities of magnetic energy in a small space without the production of significant magnetic pollution outside of the apparatus.[5] Prueitt accomplishes this with the use of a superconducting toroid 12 that uses inner toroidal windings 12a, and outer poloidal windings 12b.[6] The primary reason for

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[1] Specification page 3, lines 28-30.
[2] Specification page 6, lines 3-6.
[3] Specification page 6, lines 13-16.
[4] Specification page 7, lines 1-3
[5] Prueitt, col. 2, lines 29-34.
[6] Prueitt, col. 2, lines 39-41.

alternating the current flow in alternate toroidal windings 12a, is to eliminate magnetic field pollution outside of the module 10.[7]

Prueitt does not, however, describe using an electrical insulation as claimed. The outstanding Office Action recognizes this deficiency in Prueitt and asserts Elton to cure the deficiency. With regard to the electrical insulation, the outstanding Office Action further asserts that "Elton shows this feature to be old in the superconductor art".[8] Applicants traverse this assertion. Elton is silent with regard to any application to the superconducting art.

The "invention" in Elton is about the use of a pyrolyzed glass fiber material as a semiconductor material used in various applications. This is more evident from the parent application in Elton, now US Patent No. 4,853,565, which Elton '165 is a divisional application. During the prosecution history of Elton '165, much of the original specification was deleted. For example, the sole figure in Elton '165 is actually Figure 7 in Elton '565. In Elton '565, the pyrolyzed glass fiber material is used in three different applications: Figure 7 in Elton '565 is directed to a power cable embodiment, which is a separate embodiment from Figures 1-6, which show the pyrolyzed glass material used as an armature bar of a stator in a rotating electric machine.

The cable, a power cable, in Elton is for use in long, stretched out runs, where there are no bends therein. This is relevant because the cable shown in Elton cannot be manufactured in a coiled configuration for use in a stator, or in a storage device that requires coil windings that are formed with one turn on top of another. The pyrolyzed

[7] Prueitt, col. 2, lines 49-51.
[8] Office Action, page 3, third from last line.

glass material needs to be cured[9]. Once it is cured, the material becomes stiff. If bent after becoming stiff, the material cracks and develops voids, which would give rise to a cable failure if exposed to a high voltage stress. While it is possible to cure the outer layer of the cable after it is coiled, the insulation structure actually has an inner layer of semiconducting material as well (layer 104). If the inner layer is cured before the insulation and outer layer are applied, then there is no way to later bend and form the outer layer without damaging the inner layer. Thus, there is no way to make the cable of Elton in a "compact" coiled configuration for use in the compact magnetic energy storage module of Prueitt. Consequently, the outstanding Office Action has not presented a *prima facie* case of obviousness.

Because a combination of the cable in Elton with the compact magnetic energy storage module of Prueitt would result in an inoperable device, it is respectfully submitted that the combination of Prueitt in view of Elton does not render obvious the invention defined by Claim 37. Because Claims 38-40, 44-57, 59, and 61 depend from Claim 37, it is respectfully submitted that these claims also patentably define over Prueitt in view of Elton. Since Claims 62 and 68-74 also are rejected over the same prior art, it is respectfully submitted that these claims also patentably define over Prueitt in view of Elton.

Claims 41-43, 58, and 75-78 are rejected as being unpatentable over Prueitt, Elton and in further view of GB '195. The basis of this rejection is that either Prueitt or Elton disclose the claimed invention except for a fluid passage through the center of the superconductor and the use of propylene rubber as the insulation layer, but GB '195 is asserted for this deficiency. However, even if GB '195 does teach these features (and

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[9] See, Elton '565.

there is no admission that it does), GB '195 is also deficient with regard to the use of the claimed electrical insulation system used as part of a SMES coil. Thus, even the combination fails to teach or suggest all of the elements of the claimed invention, at least for the reasons discussed above with regard to claim 37, for example.

Claims 63-67 are rejected as being unpatentable over Prueitt in view of Elton and in further view of Donaldson. Donaldson is asserted for its disclosure of a superconducting device used at high voltages. However, even if this is the case, the combination of Prueitt in view of Elton and Donaldson does not teach or suggest the invention defined by Claim 62, which as discussed above is believed to patentably define over Prueitt and Elton. Because Donaldson, does not cure the deficiencies of combining the cable of Elton with the device of Prueitt, it is respectfully submitted that Claims 63-67 also define over Prueitt in view of Elton and Donaldson.

Consequently, in view of the present amendment and in light of the foregoing comments, it is respectfully submitted that the invention defined by Claims 37-78 is definite and patentably distinguishing over the prior art. The present application is

therefore believed to be in condition for formal allowance and an early and favorable reconsideration of this application is therefore requested.

Respectfully submitted,

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IN THE SPECIFICATION

Page 2, please replace lines 25 - 30 as follows:

--SMES devices have a high efficiency and a high energy density compared with competing system for storing energy. SMES devices can have a rapid response to demands of storing or discharging. In addition, [SEES] <u>SMES</u> devices can be used not only for load-levelling but also for load-following, for spinning reverse, for transient stabilization, and for synchronous resonance damping. SMES can provide not only energy savings but also a larger freedom of power system operation.--

IN THE CLAIMS

37. (Amended) [An SMES] <u>A superconducting magnetic energy storage, SMES,</u> device comprising:

a switch configured to short circuit a coil; and

said coil configured to be connected in series with a voltage source and wound from a superconducting cable, said coil including

a superconductor maintained at cryogenic temperatures below a critical temperature during use, and

an electrical insulation configured to surround said superconducting material, wherein said electrical insulation including

an inner layer of semiconducting material electrically connected to said superconductor,

an outer layer of semiconducting material held at a controlled electric potential along a length of said outer layer of semiconducting material, and

an intermediate layer of a solid electrically insulating material positioned between said inner layer of semiconducting material and said outer layer of semiconducting material.

62. (Amended) A high voltage system, comprising:

[an SMES] <u>a superconducting magnetic energy storage, SMES,</u> device having a superconductor insulated against a high voltage by an electric insulation system arranged concentrically around said superconductor.

73. (Amended) The high voltage system according to claim 62, wherein said insulation system comprises:

[at least one of a cellulose-based, synthetic paper and a non-woven fibre material being co-lapped with a synthetic film and including]

an inner semiconductor part in electric contact with said superconductor <u>including at least one of a cellulose-based, synthetic paper and a non-woven fibre material being co-lapped with a synthetic film,</u>

an electrically insulating intermediate part, and

an outer semiconducting part around said electrically insulating intermediate part.

74. (Amended) The high voltage system according to claim 62, wherein said insulation system comprises:

[at least one of a cellulose-based, synthetic paper and a non-woven fibre material being laminated with a synthetic film and including]

an inner semiconductor part in electric contact with said superconductor <u>including at least one of a cellulose-based, synthetic paper and a non-woven fibre material being laminated with a synthetic film,</u>

an electrically insulating intermediate part, and

an outer semiconducting part around said electrically insulating intermediate part.

79. (Amended) [An SMES] <u>A superconducting magnetic energy storage, SMES,</u> device comprising:

a switch configured to short circuit a coil; and

said coil configured to be connected in series with a voltage source and wound from a superconducting cable, said coil including

means for superconducting maintained at cryogenic temperatures below a critical temperature during use, and

means for electrically insulating said means for superconducting, including

an inner layer of a semiconducting material electrically connected to said means for superconducting;

an outer layer for semiconducting material held at a controlled electric potential along a length thereof, and

an intermediate layer of a solid electrical insulation positioned between said inner layer and said outer layer.